ENGINEERING EXPERIMENT STATION
of the Georgia Institute of Technology
Atlanta, Georgia

SPECIAL REPORT

PROJECT NO. A-341

BIOCHEMICAL OXYGEN DEMAND TESTS AND DISSOLVED OXYGEN DETERMINATIONS OF WATERS IN AND AROUND THE CITY OF FITZGERALD, GEORGIA

Prepared for

THE FITZGERALD WATER, LIGHT AND BOND COMMISSION

By

R. H. FETNER, Ph.D.

JULY 26, 1957

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Water samples were taken from Turkey Branch Stream and tributaries at various locations. This work was performed at the request of the City of Fitzgerald Water, Light and Bond Commission. All sampling techniques and chemical determinations were made according to methods outlined in the Standard Methods for the Examination of Water, Sewage and Industrial Wastes, 10th edition, 1955.

The 5-day dilution technique was used to determine the biochemical oxygen demand (BOD) of the various water samples. All samples were taken in duplicate at each sampling point. Table I gives the code number, location and description of each sampling point. As an aid in locating these sample points they are shown in Figure 1. Table II presents the results obtained on the samples described in Table I.

Chemical Oxygen demand tests† were run on these same samples. The results agreed quite closely with the BOD values, indicating that the oxidizable material (pollutants) were biologically available.

A definition of BOD may be stated as follows: "The quantity of oxygen utilized in the biochemical oxidation of organic matter in a specified time and at a specified temperature. It is not related to the oxygen requirements in chemical combustion, being determined entirely by the availability of the materials as a biological food and by the amount of oxygen utilized by the microorganisms during oxidation"[1]. The importance of the BOD as a criteria of pollution has been stated by Gurnham[2] as follows: "The biochemical oxygen demand, or BOD, of a waste is usually the most important single criteria used

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[1] Water and Sewage Control Engineering, American Public Health Assoc., 1949.

[2] Gurnham, C. F., Principles of Industrial Waste Treatment. Wiley & Sons, New York, 1955.

† The dichromate reflux method

TABLE I

LOCATIONS AND DESCRIPTIONS OF SAMPLES

Sample	Location	Description
A	Turkey Branch from the bridge of road #S1313†. This is below the first septic tank outfall.	Water gave the appearance of a high degree of pollution and had a hydrogen sulfide odor.
B	Turkey Branch from the next road bridge below A. This is below the second septic tank.	Essentially the same as A.
C	The Turkey Branch tributary immediately below septic tank No. 3 and before the railroad trestle.	There is a very small flow of water here and at the time of sampling the water did not present noticeable evidence of pollution.
D	The Turkey Branch tributary at the railroad trestle.	There is a considerably greater flow of water here, approximately the same as at points A and B on the other tributary. Immediately above the railroad trestle water drains into the branch from a swampy area behind the Fitzgerald Gum Processing Co. The water draining from the area had a milky appearance and imparted this color to the stream.
E	The Turkey Branch tributary from the road bridge below the outfall of the Meat Packing Co.	The water no longer had a milky appearance. The flow was about the same as at D.
F	Turkey Branch below the Junction of the tributary and Turkey Branch.	The water gave the appearance of having recovered somewhat from its pollution load. A few small minnows were observed.

†General Highway Map of Ben Hill County, Georgia, prepared by State Highway Dept. of Georgia.

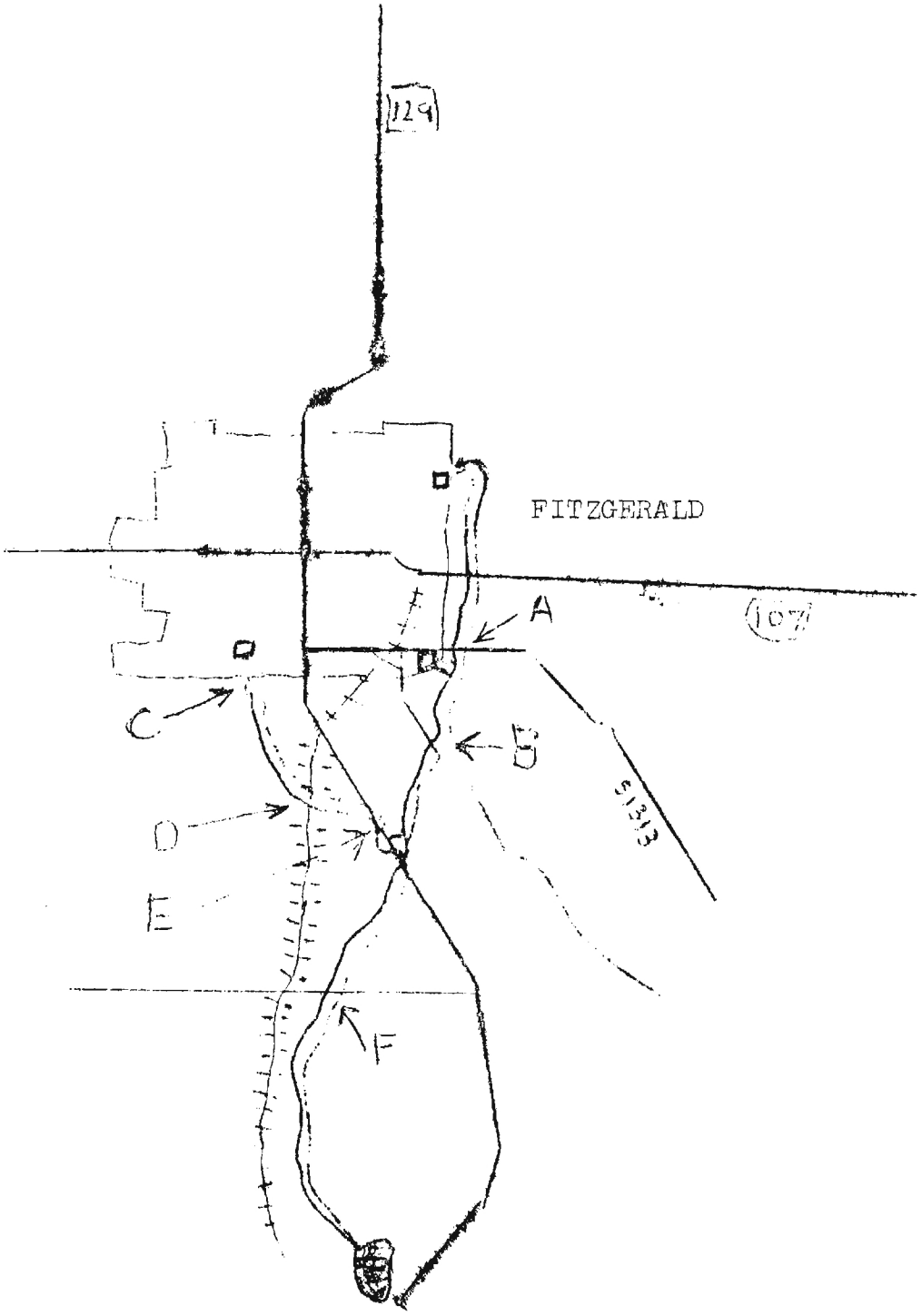

Figure I. Location of sample points.

TABLE II

RESULTS OF DO† AND BOD†† TESTS

Sample	Temperature (°C)	DO (ppm)	5-day BOD (ppm)
A	30	0.0	105 ± 5
B	30	0.0	100 ± 4
C	29	2.0	33 ± 1
D	29	0.0	413 ± 18
E	28	0.0	330 ± 12
F	29	0.6	55 ± 2

†Dissolved Oxygen

††Biochemical Oxygen Demand

to express pollutional effects. In a natural stream, and in the laboratory determination of BOD, the oxygen required is provided by the dissolved oxygen in the water or wastes. Since this dissolved oxygen cannot exceed about 14 parts per million and is usually less than half that concentration, it is apparent that the oxygen demand of a strong waste can be satisfied or destroyed only by dilution with a large amount of oxygen bearing water or by abundant replenishment of dissolved oxygen by photosynthesis or absorption from the atmosphere. If the dissolved oxygen is depleted, organisms will use combined oxygen from nitrate, nitrite and sulfate ions and form organic compounds in the waste,

with formation of such gaseous compounds as methane and hydrogen instead of the carbon dioxide and water formed under aerobic conditions."

Respectfully submitted:

K. H. Fetner
Project Director

Approved:

Wyatt C. Whitley, Chief
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